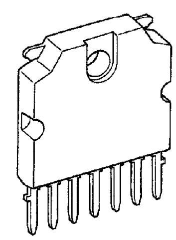
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8201AK

BTL AUDIO POWER AMPLIFIER

The TA8201AK is audio power amplifier for consumer application.
This IC is applying BTL system in which output coupling condenser and bootstrap condenser are not necessary and output 17W (V_{CC} = 14.4V, B_L = 4Ω, THD = 10%) can be obtained.
Since the package is a 7 pin SIP, (Single Inline Package), it greatly simplifies construction of a power amplifier both in design and assembly.
It also contains various kind of protector.
It is suitable for car-audio power amplifier with high performance.



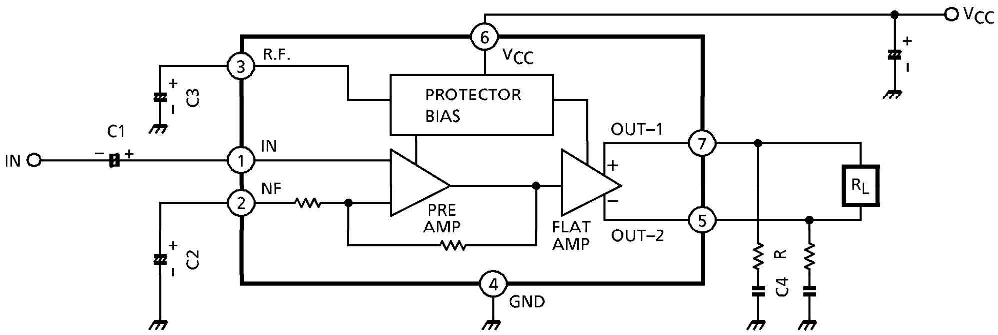
HSIP7-P-2.54B

Weight : 2.19g (Typ.)

FEATURES

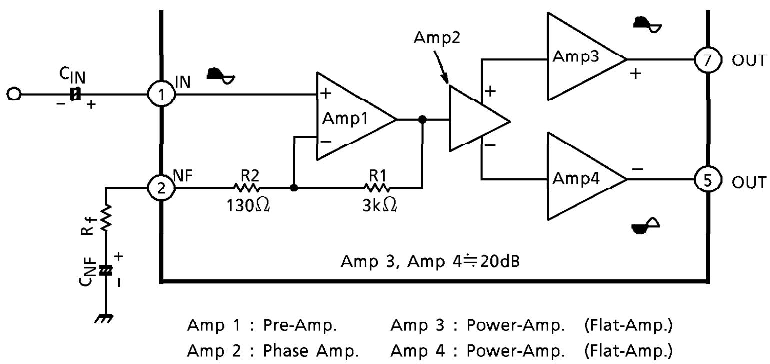
- High Power : $P_{OUT\,(1)}$ = 17W (Typ.)
  (V_{CC} = 14.4V, f = 1kHz, THD = 10%, R_L = 4Ω)
  : $P_{OUT\,(2)}$ = 14W (Typ.)
  (V_{CC} = 13.2V, f = 1kHz, THD = 10%, R_L = 4Ω)
- Very Few External Parts
- Built in Protector Circuit
  Thermal Shut Down, Over Voltage Protector (Typ. V_{CC} = 24V)
  ASO Protector (R_L Short, Out to GND, Out to V_{CC})
- 7 pin Small Package
- Operating Supply Voltage Range : V_{CC} = 9~18V

BLOCK DIAGRAM



DIRECTIONS FOR USE AND APPLICATION METHOD

1. VOLTAGE GAIN ADJUSTMENT



(Fig.1)

This IC has the amplifier construction as shown in Fig.1. The Pre-Amp. Amp 1 is provided to the primary stage, and the input voltage is amplified by the Flat Amps, Amp 3 and Amp 4 of each channel through the phase Amp. Amp 2.

Since the input offset is prevented by Pre-Amp when V_{CC} is set to ON, this circuit can remarkably reduce the pop noise.

The total closed loop gain G_V of this IC can be obtained by expression below when the closed loop voltage gain of Amp 1 is G_{V1}.

$$G_{V1} = 20\ell og \frac{R1 + (R_f + R2)}{R_f + R2} \text{ (dB)} \quad \ldots\ldots \quad (1)$$

The closed loop voltage gain of POWER Amp, Amp 3 and Amp 4 is fixed at $G_{V3} \fallingdotseq G_{V4} = 20\text{dB}$.

Therefore, the total closed circuit voltage gain G_V is obtained through BTL connection by the expression below.

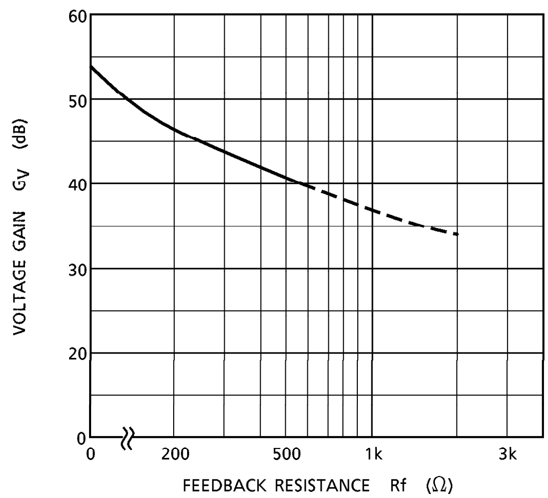
$$G_V = G_{V1} + G_{V3} + 6 \text{ (dB)} \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

For example, when $R_f = 0\Omega$, G_V is obtained by the expression below.

$G_V \doteqdot 28 + 20 + 6 = 54$ (dB)

The voltage gain is reduced when R_f is increased. (Fig.2)

With the voltage gain reduced, since ① the oscillation stability is reduced, and ② the pop noise changes when V_{CC} is set to ON, refer to the items 2 and 4.



(Fig.2)

2. CAPACITIVE VALUE OF INPUT AND NF CAPACITOR

This IC has the built-in circuit which makes the input voltage of AMP. 1 and the voltage of NF terminal equal at $V_{CC} \rightarrow$ON by means of providing the pre-AMP (AMP 1) at the first stage. Therefore, the off-set voltage produced at the first stage is suppressed, and the pop noise is prevented.

Set the capacitive value of input and NF capacitor according to the gain to be used.

[Reference] (A) At $G_V = 54$dB ($R_f = 0$) $C_{IN} = 4.7\mu F$, $C_{NF} = 47\mu F$

(B) At $G_V = 40$dB ($R_f = 560\Omega$) $C_{IN} = 3.3\mu F$, $C_{NF} = 33\mu F$

3. CAPACITANCE OF RIPPLE FILTER CAPACITOR

The capacitance of the ripple filter capacitor of ③ pin determines the time constant at $V_{CC} \rightarrow$ON and $V_{CC} \rightarrow$OFF.

Since the pop noise varies according to the capacitance of the ripple filter capacitor, $C3 = 220\mu F$ recommended.

Having the built-in rapid discharging circuit of Ripple and NF voltage at the time when $V_{CC} \rightarrow$OFF, this IC is effective for preventing the pop noise of V_{CC} continuous ON / OFF.

4. PREVENTIVE MEASURE AGAINST OSCILLATION

For preventing the oscillation, it is advisable to use C4, the condenser of polyester film having small characteristic fluctuation of the temperature and the frequency.
The resistance R to be series applied to C4 is effective for phase correction of high frequency, and improves the oscillation allowance.
Since the oscillation allowance is varied according to the causes described below, perform the temperature test to check the oscillation allowance.

① Voltage gain to be used (G_V setting)
② Capacity value condenser
③ Kind of condenser
④ Layout of printed board

By increasing R_f, decrease of G_V is possible.
However, care must be taken since the feedback increase is liable to produce oscillation.

5. EXTERNAL PART LIST AND DESCRIPTION

NAME OF PART	RECOMMENDED VALUE	OBJECT	INFLUENCE		REMARKS
			SMALLER THAN RECOMMENDED VALUE	LARGER THAN RECOMMENDED VALUE	
C1	4.7μF	DC blocking	Related to popping noise at V_{CC}→ON		Related to gain. Refer to item 2.
C2	47μF	Feedback condenser	Related to popping noise at V_{CC}→ON		
			Determination of low cut-off frequency. $C2 = \frac{1}{2\pi f_L \cdot R_f}$		
C3	220μF	Ripple reduction	Time constant is small at V_{CC}→ON or OFF.	Time constant is large at V_{CC}→ON or OFF.	Refer to item 3.
C4	0.15μF	Oscillation prevention	Made liable to oscillate.	Oscillation allowance improved.	Refer to item 4.
C5	1000μF	Ripple filter	For filtering power supply hum and ripple. Large at using AC rectified power supply. Small at using DC power supply.		

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2 sec)	$V_{CC\ (surge)}$	50	V
DC Supply Voltage	$V_{CC\ (DC)}$	25	V
Operating Supply Voltage	$V_{CC\ (opr)}$	18	V
Output Current (Peak)	$I_{O\ (peak)}$	4.5	A
Power Dissipation	P_D	15	W
Operating Temperature	T_{opr}	−30~85	°C
Storage Temperature	T_{stg}	−55~150	°C

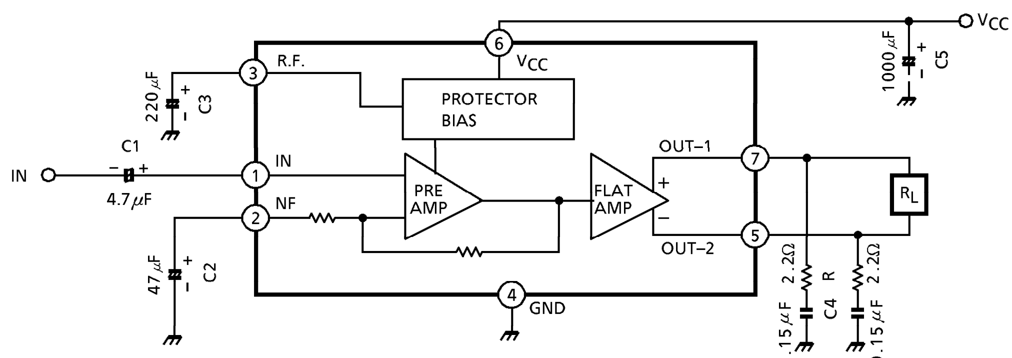
ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC} = 13.2V, R_L = 4Ω, f = 1kHz, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current	I_{CCQ}	—	V_{IN} = 0	—	60	95	mA
Output Power	$P_{OUT\ (1)}$	—	V_{CC} = 14.4V, THD = 10%	—	17	—	W
	$P_{OUT\ (2)}$	—	THD = 10%	10	14	—	
Total Harmonic Distortion	THD	—	P_{OUT} = 1W	—	0.05	0.4	%
Voltage Gain	G_V	—	R_f = 0Ω	52	54	56	dB
Output Noise Voltage	V_{NO}	—	R_g = 10kΩ, BW = 20Hz~20kHz	—	0.9	2.0	mV_{rms}
Ripple Rejection Ratio	R.R.	—	fripple = 100Hz, R_g = 600Ω	40	50	—	dB
Input Resistance	R_{IN}	—	f = 1kHz	—	30	—	kΩ
Output Offset Voltage	V_{offset}	—	V_{IN} = 0	−0.3	0	0.3	V

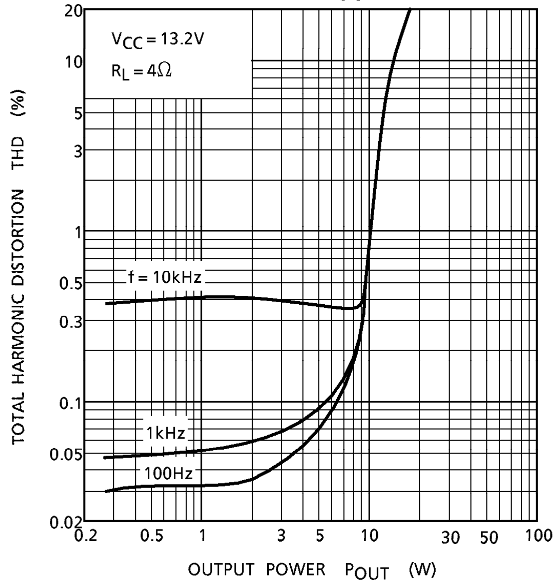
TYPICAL DC VOLTAGE OF EACH TERMINAL (V_{CC} = 13.2V、V_{IN} = 0V、Ta = 25°C)

TERMINAL No.	1	2	3	4	5	6	7
Terminal	IN	NF	R.F	GND	OUT	V_{CC}	OUT
DC Voltage (V)	4.55	4.55	4.55	0	5.6	13.2	5.6

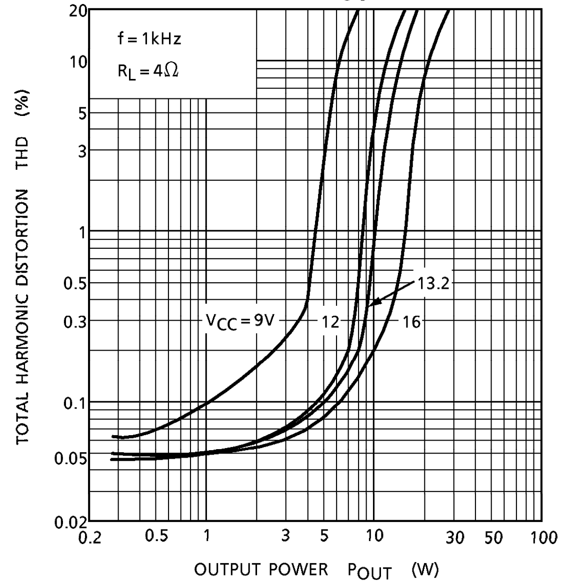
TEST CIRCUIT / APPLICATION CIRCUIT



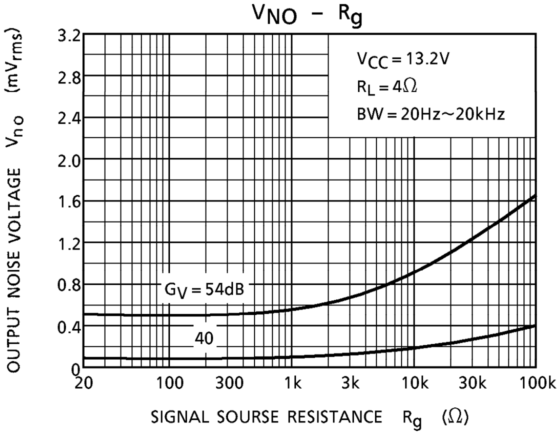
THD – P_{OUT}



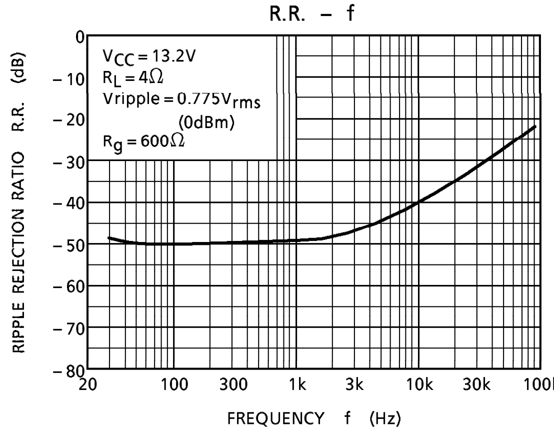
THD – P_{OUT}



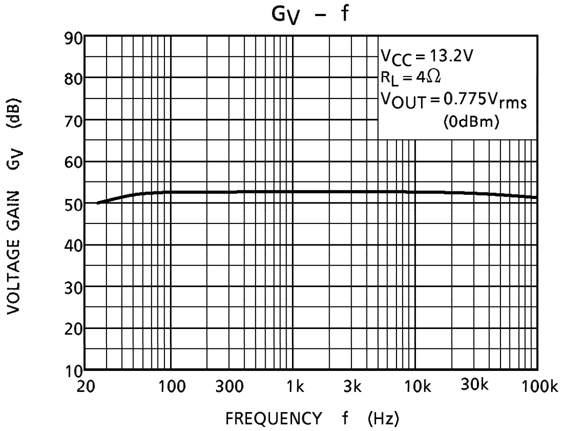
V_{NO} – R_g



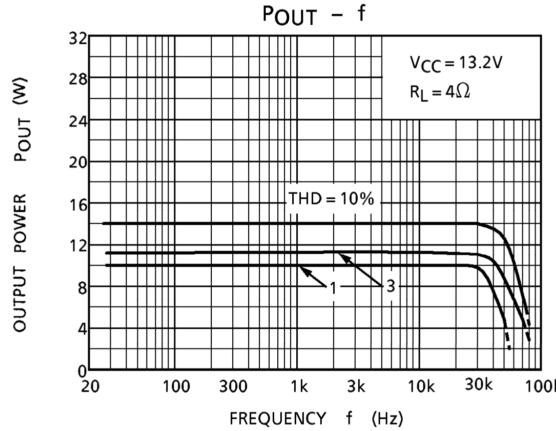
R.R. – f



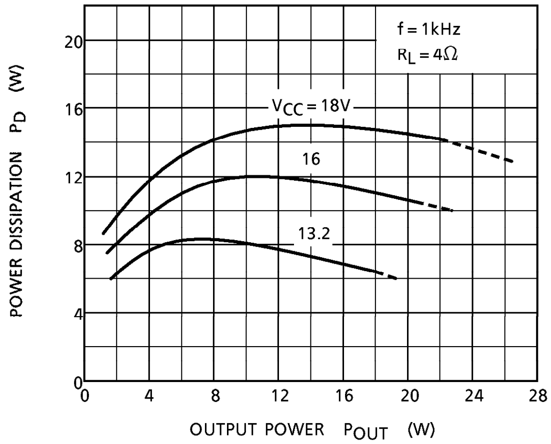
G_V – f



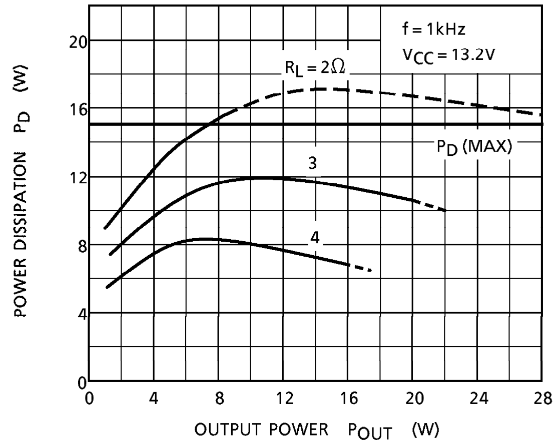
P_{OUT} – f



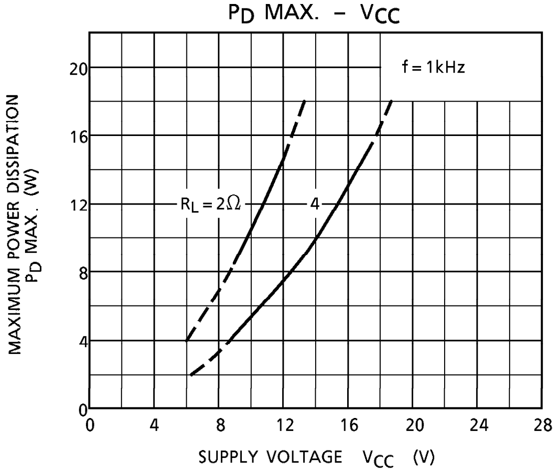
P_D – P_{OUT}



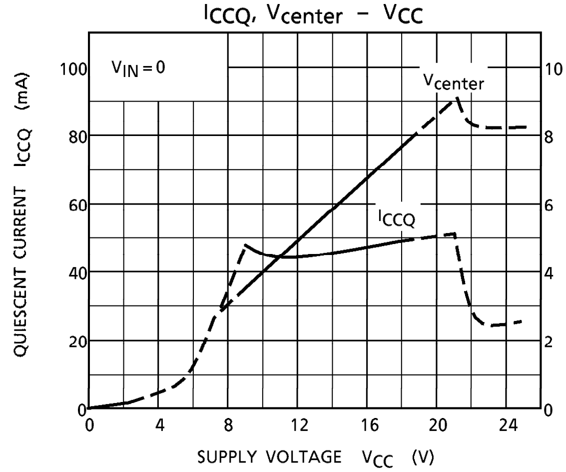
P_D – P_{OUT}



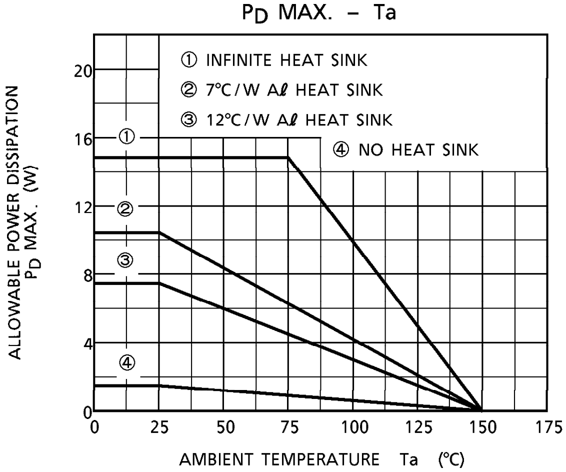
P_D MAX. – V_{CC}



I_{CCQ}, V_{center} – V_{CC}

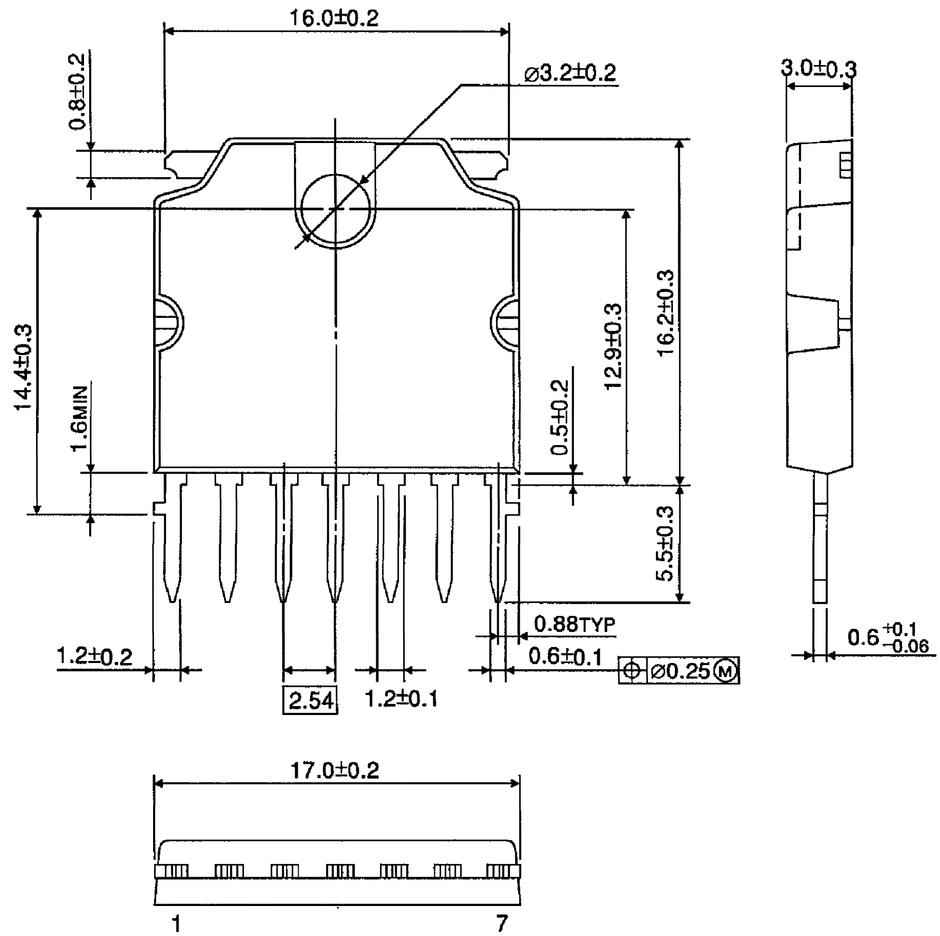


P_D MAX. – Ta



OUTLINE DRAWING
HSIP7-P-2.54B

Unit : mm



Weight : 2.19g (Typ.)